The JOHNSON NATIONAL DRILLERS JOURNAL

Vol. 22, No. 4 THE JOHNSON NATIONAL DRILLERS' JOURNAL July-Aug., 1950

GROUND WATER RESOURCES AND THEIR CONSERVATION

INFLUENCE OF ROCK STRUCTURES ON GROUND WATER

Many well drillers give little thought to the influence of rock structures on ground water. They are more interested in the mechanical problems of drilling than the study of rock formations. While it is not intended that well drillers become experts on the subject of rock structure, still it is helpful if a driller has a little background information of this kind.

Most everyone knows the earth's crust is made up of a series of layers or stratas of rocks of various kinds and origin. These stratas may be a few feet or several hundred feet in thickness and they may extend over considerable area. They may be at the surface in one part of the country and buried hundreds of feet in another. To the well driller it is not so important that he know how this came about but rather it is important to know where they are and how much water can be taken from them.

Naturally the younger formations are at the surface. As drilling proceeds, each successive rock structure or formation is penetrated. The driller should be able to recognize each change in formation and know whether it is water-bearing or not. He should also realize that the same formations will vary considerably in their ability to yield water depending on their location and adjacent formations. Just because a formation is water-bearing in one location is no sure sign that it is in another.

The material situation as far as well screens and fittings are concerned is not good, and it looks like it might become worse before it will be better.

Copper alloys are particularly hard to get under present conditions and we do not always have both of them in stock.

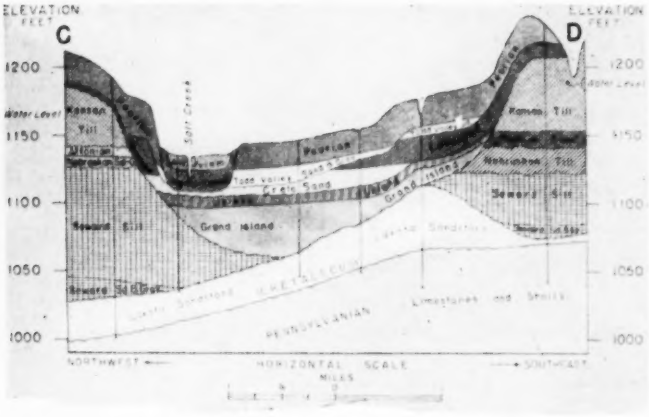
Therefore, we suggest that orders be placed as far in advance as possible, with first and second choice indicated, whenever this is possible. We in turn will do all we can to obtain materials and make shipments without unnecessary delay.

An accurate log of a well or test hole at any given place will give a picture, or as geologists call it, a section, for the depth of the drilling. The information contained in a log is the principal clue to ground water conditions in that locality as each separate rock strata can be recognized and those which are water bearing located with reasonable accuracy. The information can be checked against the logs of other wells in the area, including their yield, head and quality of water.

If the formations penetrated are all of sedimentary in origin, the various stratas found lie one on top of the other like a pile of books and there may be minor stratas found which can be likened to the leaves of a book. These leaves of the book may and often times do vary in compactness and composition. They may be thin lenses of clay, shale or limestone that effectively cut off all water from both above and below. These are the little things that affect the yield of a given formation and are the reason why no two wells will function alike even if constructed the same depth in the same formation. The major changes in stratification are definitely due to major geologic changes in time while the minor changes or the leaves of the book may be due to local or temporary disturbances. It is the minor changes or thin layers which very largely control the occurrence and movement of ground water.

Any stratified formation changes from place to place, both in thickness and water-bearing ability. For this reason it is essential to know as much about the extent or area of a formation as possible, how it was formed and what changes have taken place in it from one point to another. For streams flowing from high mountains deposit boulders, stones and pebbles near the mountains, but the finer material is carried for many miles out on the plain. In the same way, the formations found along seashores may be made up of clean sand or mostly mud and clay. It all de-

(Continued on Page 2)



Section across Salt Creek Valley near Lincoln, Nebraska, showing nature, thickness and distribution of Pleistocene formations and their relation to Cretaceous and older formations. (Nebraska Geological Survey Bulletin 15).

Ground Water Resources and Their Conservation

(Continued from Page 1)

pends on the wave and current movements. The water-bearing formations along the Atlantic Coast are relatively coarse where they outcrop, but they become thinner and the sand finer the closer they are to the sea. In Montana the Upper Cretaceous formations gradually change as they move eastward from the Rocky Mountains, until in South Dakota these formations are nothing but dry shale, (Pierre).

In glacial drift and alluvial formations most anything is liable to be found. There is no continuity throughout these formations. In places they may be mostly sand and gravel and within the same formation, only a short distance away clay and silt may predominate. For this reason no one is ever sure of what they are going to find without first putting down a test hole. To fully appreciate the difference between glacial drift and alluvial formations as water bearers, it should be kept in mind that glacial drift is a conglomeration of boulders, stones, gravel, coarse and fine sand all laid down in a jumbled mass by glacial action and running water. When sand and gravel predominates, glacial drift yields water freely.

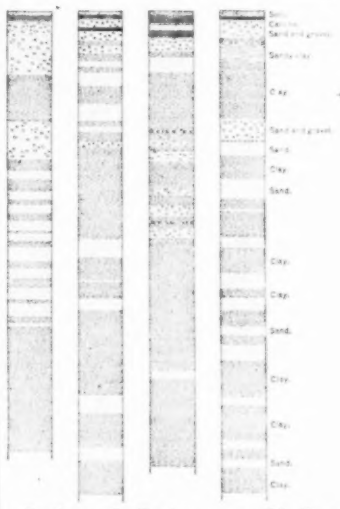
Alluvial formations are similar to glacial formations in many ways and are often mistaken for them. The difference is that alluvial formations are found in stream valleys and in dry arid areas of the West near the mountains. Alluvial deposits in lake beds may be slightly stratified but usually are simply mixtures of alluvium, fine sand, clay, etc.

Geologists have ways of examining formations and determining their age but the average well driller cannot tell the difference in origin between sands and gravels without a good deal of close observation and experience. Fortunately it is not often necessary for the driller to determine these things, however, it helps to know that there are differences and not gamble too much on two sand and gravel stratas which look alike.

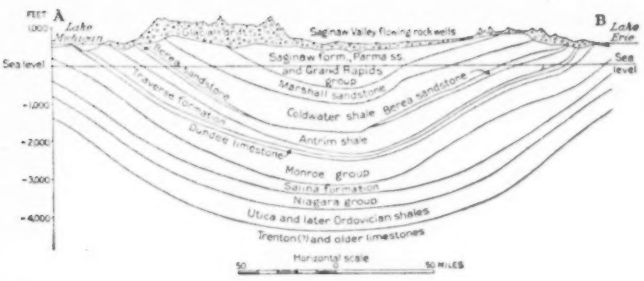
Many drillers have found it helpful to collect all of the data they can on wells in their areas, regardless of whether they drilled the wells or not. This information is valuable if used properly. In the same way it can be misleading unless the various strata can be recognized and related to each other. Naturally to recognize a formation it must be examined. Well drillers as a group have their ways of examining drillings. Some go by feel, some by looks, some by taste, others by guess and by gosh. Granting that experienced drillers are good judges of water-bearing sand they cannot always distinguish between two sands as to whether they are glacial or alluvial in origin.

There are a number of simple tests which with the help of a hand magnifying glass may be of great help in recognizing formations of various kinds. According to Illinois Geological Survey Bulletin No. 24, samples of sand, gravel, conglomerate or sandstone should be examined for adherence or cementing. In soft sandstone there is very little cementing while in a hard sandstone it may be greater. If there is a cementing agent noticeable, it can be tested as to calcium or iron with a few drops of muriatic acid. If calcium, it will dissolve readily, if iron it will not. The size of grains is always determined by a sieve analysis. What may be fine sand to one driller is coarse sand to another and occasionally we see sand samples referred to as a gravel. The proper designation of sand and gravel sizes is very important but they cannot be adequately described by saying they are like flour, cement, sugar, gun powder or any other granular material.

(Continued on Page 3)



Sections of alluvium near El Paso, Texas showing abrupt changes from place to place. The wells furnishing these sections are all on the same tract of a few acres. (W.S.P. 489).



Geologic map and section of southern peninsula of Michigan, illustrating a structural basin. (W.S.P. 489).

(Continued from Page 2)

The shape of sand grains tells much about their origin and whether they were deposited by water. At the same time the polish on the surfaces can be noted and after a little experience even the material making up the grains can be recognized. There is a vast difference between a formation made up of pieces of limestone and one made up of smooth round pebbles. There are other things such as color, fossil marks, laminations, etc., all of which help the experts recognize a formation. If a sample shows no reaction under a few drops of acid, it is probably some form of gypsum or dolomite. On the other hand, if it shows a reaction, there probably is some form of calcareous material in the sample. Clay reacts slowly but the action can be seen, marl leaves an insaluble residue. While dolomite will effervesce slowly, limestone breaks down rapidly. These simple tests soon lead to others and many well drillers who can make such tests find them interesting and at the same time helpful.

After a driller is able to distinguish one formation from another, he is in position to work out the stratification in an area and from this information predict the depth to water-bearing formations. As a rule, rock stratas are seldom horizontal. They generally dip gently at rates which can be predicted by comparing their depths in a given direction. One thing drillers lose sight of is the effect of distance. Suppose a good water-bearing formation is found at a depth of 100 feet and other wells nearby show that it dips in a given direction at the rate of 8 feet per mile. This is a very gentle dip, but between location 8 miles apart there will be a difference of 64 feet assuming the surface elevations are the same. If there is a difference in surface elevation, this difference should also be taken account of in predicting the depth to the same formation. It is also well to make sufficient study of the stratification of an area to determine whether there are any outcrops of older formations. In other words, the stratas may not be continuous over an area, due to folds, faults, slips or tilts in the strata. In fact, where the stratas are badly mixed due to geological disturbances, it is possible to have a permeable formation full of water in one place and dry in another. A permeable formation may even be continuous but due to its position with reference to the water table and stratification, it is not a foregone conclusion that it is water-bearing.

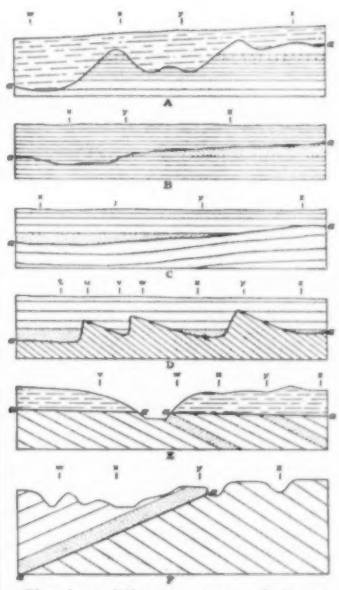
The study of stratification sooner or later involves a consideration of the geological term, "unconformity." While the average well driller may never encounter the term, there are times when a knowledge of it is useful, as two geologic formations which are easily recognized may be separated by an "unconformity." In other words, an "unconformity" represents an interval which may be thousands of years of time during which time no sediments were deposited, but the underlying rocks were disturbed and became broken, warped, tilted or eroded away entirely. Plainly speaking, an unconformity is a break between two formations.

Data concerning unconformities is obtained by observing natural and artificial eposures of stratas and from the information contained in well logs. Inasmuch as unconformities are irregular in shape and vary greatly in extent and thickness, they may be present at one location and entirely missing in another. For this reason it is difficult to recognize them and correlate their significance with other log information.

In well drilling the term basic rock or basal rock is often used to denote the depth to which a well is to be drilled. Sometimes drillers take this to mean the first solid rock formation encountered.

This is not always the case as basic rock means the hard crystalline rocks which underly the entire region. They are the oldest rocks in an area which when reached by a well usually indicate the depth beyond which there are little or no prospects for water. All of the formations lying above the basic rock are younger in age. They may or may not be water-bearing and it is not uncommon to find a deposit of sand and gravel resting

(Continued on Page 4)



Showing different types of "unconformities" that may be encountered in well drilling. (W.S.P. 489).

Ground Water Resources and Their Conservation

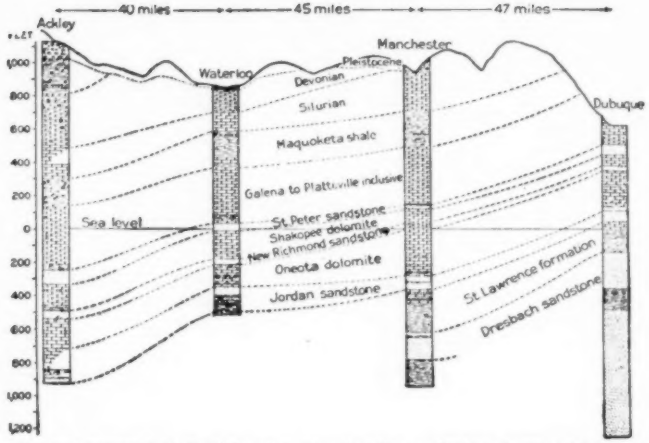
(Continued from Page 3)

unconformably on the older formations. Water therefore is often obtained from the sand and gravel beds lying above an unconformity.

In drilling rock wells where joints, faults, fissures, fractures, etc., are encountered, their presence or absence is not always fully appreciated as sources of water. All rock formations contain this sort of openings, some of them more, some of them less. A joint is a natural rock fracture, while a fault is a joint which has slipped due to a movement of the rock on either side of the joint. Joints are found in most all hard, brittle rocks. If a formation has a number of large joints or contains fractured zones with belts of heavy compact rock in between, it is more practicable to sink wells in an area where the fractured rock will be penetrated than to select a site at random. Oftentimes by checking the slope and direction of a large joint a well can be located which will intersect it below the water table. Wells built to get their water from joints may be and oftentimes are polluted from sources many miles distant from the well.

Veins are openings that are either partially or completely full of mineral matter which has been deposited in them by percolating water. They are not water producers but they cause trouble in drilling as they are harder to drill and likely to deflect the drill causing a crooked hole.

Small faults or joints are not reliable as sources of water and for that reason are not important, but large well-known faults or joints that can be located and traced several miles and which may extend to great depths are oftentimes a very important source of water supply. Occasionally drillers will assume that faults are responsible for changes in the formation which they do not understand but most of these changes do not exist or are due to unconformities. Faults are rare in flat lying formations but where they occur they may act as underground dams and be the cause of considerable difference in both quantity and water level on either side of the dam. Faults serve as both containers and carriers of water, thus deep water often finds its way upward through faults and appears at the surface in the form of springs.

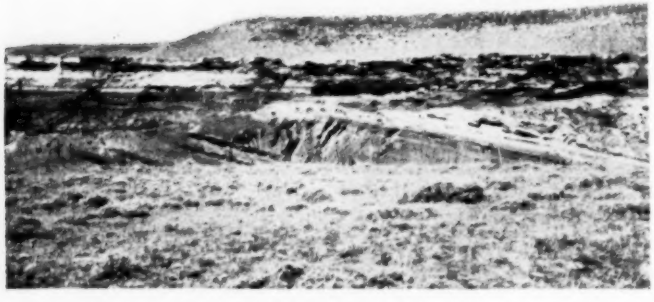


A good example of stratification, showing the geologic and ground water conditions over a large area in Iowa underlain by sedimentary rocks. (W.S.P. 489).

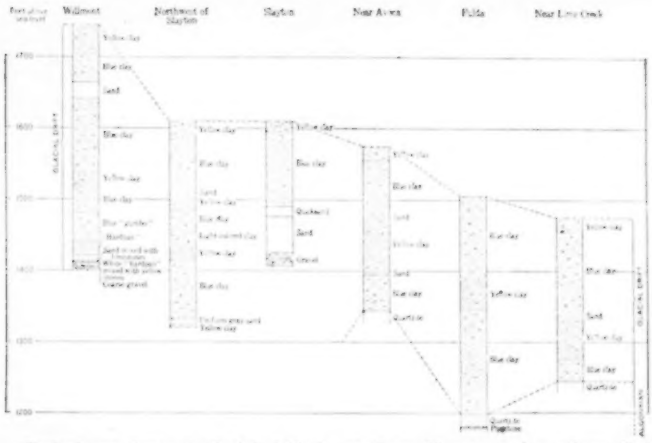
Large areas of the United States in the Northwest are underlaid by extensive sheets of basalt. This is an igneous rock thrown up by volcanic action. It usually is found in thin beds from 50 to 150 feet thick lying horizontally. In some places it is found on top of sandy alluvial, in other places it is found several hundred feet below the surface interbedded with other formations. Usually lava beds near the surface are very porous, being heavily jointed and badly broken up because of rapid cooling.

Finally, a close observation of surface features often give reliable clues to ground water conditions underneath. In low flat lying regions not bordered by higher land, all granular formations become filled with water, oftentimes to the surface. There is little movement of ground water in such areas and no opportunity for springs to occur.

(Continued on Page 5)



An unconformity of horizontal beds resting on irregular surface of tilted beds. (W.S.P. 489).



Geologic sections of glacial drift in southern Murray and northern Nobles showing changes from place to place. (W.S.P. 489).

(Continued from Page 4)

If the formations contain soluble matter, the water becomes highly mineralized. On the other hand, in a rolling, hilly or mountainous region, the water that seeps downward into the ground water reservoir soon moves along to a lower level and is discharged where the formation outcrops. The relatively fast flow has leached out the soluble matter and removed it during the ages. This is why the water from springs is usually of good quality.

While well drillers are not geologists nor is it necessary to be a geologist to be a well driller, the fact still remains that a little study of rock formations is not only helpful to the driller but is often the basis from which the engineer approaches a job of well drilling. The location of wells, their depth, the types of casing and screen to be used, the prevention of pollution and elimination of fine sand and silt all are problems that concern local formation conditions and most of the answers are found by considering these conditions rather than the details of drilling. As a matter of fact, too many well drillers look at well building as a drilling job, rather than a job of getting water out of the water-bearing formations available.

Take one type of water-bearing formation such as sand and gravel or the sandstones. There is a general belief that all such formations are good water-producers. Nothing could be farther from the facts. It is true that these formations are widespread and are found in an infinite variety of shape, size, grading and degree of cementation. Still they offer the well driller the most trouble as far as wells are concerned, as they must be properly screened to be controlled and the water they hold made available for use. The same thing is true regarding other water-bearing formations. The driller must know where they are, how much water they hold and how to get it out of them. Knowing how to drill holes will not do this but a study of the formation and its characteristics will give the answer.

WATER AND HEALTH

The well driller is often asked questions about water that should be asked of a chemist or sanitary engineer. The usual one is "Is this good water?" No one can tell by looking at a sample of water whether it is "good" or not. It all depends on what you want the water for. Most any kind of water will put out a fire or be the means of drowning, but not all can be used for drinking.

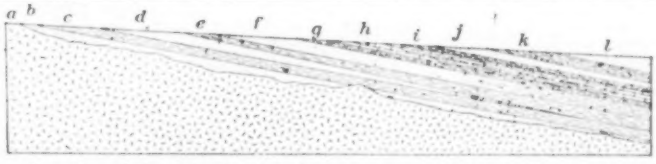
As we all know, water is vital, but most of us do not regard it as a food. Actually water is the most important of six foods which are necessary for the growth and functions of the human body. The food that we eat can not be digested nor disposed of without water, as water is the principal difference between a dead and a living cell.

Water is blamed for many of the diseases, ailments, and illnesses of mankind, but history proves that there is no ground for such blame, even though some of our worst epidemics were due to polluted water. It is interesting to note that about 90 percent of the water taken into the body is to quench thirst and 10 percent is supplied as a result of digestive processes.

Naturally there must be a method of disposing of water after it has served its purpose. Two-thirds of the water taken in is disposed of by the kidneys and one-third by other means, such as perspiration. All of this is accomplished in a relatively short time, the entire passage of water from the time taken into the body to its disposal being a matter of from two to three hours.

The length of time water is retained in body tissues varies with the diet. Salt, for instance, keeps water in the body tissues, while potassium and calcium prevent an accumulation of water. Starchy foods will give off water while protein foods tend to retain water. Thus body chemistry is important as a change in acid-base equilibrium to the alkaline side favors the retention of water in the body tissues, while a shift to the acid side results in a loss of water in the body.

(Continued on Page 9)



A section of the Atlantic Coastal Plain, showing changes in formations from place to place. (a) basal rock, (b), (d), (j), (l), sandy beds yielding water; (c), (e), (g), (i), (k), clayey beds that do not yield water; (f) sandy water-bearing bed changing to clay; (h) limestone, cavernous in upper part changing to compact and non-carvernous in deeper parts. (W.S.P. 489).

RAINFALL IN WISCONSIN

by

Prof. E. F. Bean, State Geologist

The following explanatory note regarding Professor Bean's article "Rainfall in Wisconsin" is published at the request of the Wisconsin Well Drillers, Inc. However, we feel the article is pertinent to the situation and therefore we publish it for the benefit of those interested.

"For some time newspapers and magazines have been publishing articles to the effect that the entire nation is in a critical shortage of both underground water and rainfall for domestic and industrial consumption. These articles are prepared by Bureau Chiefs of the various national bureaus such as Agriculture, Interior, Soils, etc. who are interested in setting up more and more government bureaus.

"The newspapers continue to carry articles that the nation is drying up and our water supplies are disappearing. All this propaganda, of course, does a great deal of harm to the well drilling industry in that the public may become alarmed and the Congress and the Legislature may pass highly restrictive controls and regulations limiting the entire well drilling industry. These laws are foolish and unnecessary practically all over the United States and especially in Wisconsin." (Wisconsin Well Drillers, Inc., R. H. Nienow, Secretary.)

We hear about wells being "shot" to increase their yield. Saltzgaber Drilling Company of Mansfield, Ohio apparently know how to do it as they increased the capacity of the well in the picture from 123 g.p.m. to 310 g.p.m. by shooting it with 100 pounds of 60% dynamite.

Water is one of Wisconsin's most valuable resources, the cheapest of our necessities. The cost of water used in my home during the last six months was 6.4 cents per ton. Because of its low cost and the fact that in most communities an unlimited quantity is available, we have been inclined to consider water an inexhaustible resource and take it for granted. Private and municipal supplies come from wells (ground water), from springs, and from rivers and lakes. Although about 90 per cent of our municipalities utilize ground water, over half the population depends upon surface water. This is due to the use of Lake Michigan water by Milwaukee and other lakeshore cities. The ultimate source of both ground and surface water is rainfall. Ground water is therefore a renewable resource depending upon rainfall, geology and topography. For this reason we are all interested in rainfall. During the last few months we have had a rash of newspaper and magazine articles all painting a gloomy picture. The first to come to my attention was in the **New York Herald Tribune** of December 11, 1949. In this their science editor, John J. O'Neill, headed his column, "U. S. Yearly Rainfall Declining." A partial quotation follows:

"Rain, the primary source of water supplies, is diminishing in the United States at the rate of two inches a century. Eighteen states are enjoying an increase in rainfall, but thirty states have been experiencing reduced rainfall.

"Diminished rain is indicated by United States Weather Bureau records of precipitation covering more than half a century (1886 to 1938) for each state. The average for the first half of this period were compared with the averages for the second half. The trend to dryness is tested by less complete records going back over a century . . ."

"In this country four states are close competitors for the record for decreased rainfall: Wisconsin 3.84 inches less; New Jersey, 3.81; Oregon, 3.78; and Washington, 3.77."

The **Wisconsin State Journal** headed an editorial December 18, 1949, "Wisconsin: a Future Desert?" The O'Neill data was quoted and with a newspaperman's unquestioning faith in the accuracy of newspaper data, Rex Kearney stated:

"The statistics showed—with no room for debate—that the Atlantic and Pacific coast states, the northern tier of states from coast to coast, and the "dust bowl" states are getting drier and drier. The western states and the lower Mississippi and Ohio river valley states are getting wetter."

Then, to add insult to injury, Oscar L. Chapman, Secretary of the Interior, repeats much of the same story in the February **American** in an article entitled, "Will There Be Enough Water For You?", except that he uses a loss of 3.48 inches rather than 3.84. He does admit that "This may not be a continuing decline." The general similarity of the text and the accompanying map suggests a common origin for both articles. If either of these figures was correct, it would be a matter of great concern. If rainfall is actually declining, ground water levels will fall, and water users would have reason for serious worry. All public utilities using hydro power are concerned. Framers, whether they irrigate or not, are vitally interested. The recreational industry would find it difficult to operate profitably.

We were much disturbed when these articles began to appear because we were not aware of any such decline. A study of the official Weather Bureau records showed no trend toward a drier climate in Wisconsin. It showed

(Continued on Page 7)

(Continued from Page 6)

the usual wet and dry cycles. Lothar A. Joos, Meteorolgist with the U. S. Weather Bureau in Madison, made a careful study of the records and wrote O'Neill as follows:

"The statement that Wisconsin average rainfall has declined 3.84 inches in about 50 years is not correct. We assume that your data was taken from 'Climate & Man,' the 1941 Yearbook of the U. S. Department of Agriculture because the tables in that book cover exactly the years mentioned in your article. We also compared the average precipitation for 1886-1911 with that for 1913-1938. (1912 was omitted since we did not know how the 53 year period was divided.) Computed in this way, the Wisconsin average for the first period was 30.62 inches compared with 30.42 for the second period. The decline is 0.20 inches instead of 3.84."

Mr. Joos is quoted in the **Wisconsin State Journal** of January 22, 1950, as follows:

"What is the long range trend in Wisconsin precipitation? **Students of Climatology know that it takes more than one or two dry years to make a serious drought.** Wisconsin rainfall was below normal from 1929 through 1937 and that period included the most serious drought in recent United States history. Yet 1938 brought Wisconsin the wettest year in 59 years of record. The wet period ended in 1945 and we are now in the 4th year of below-normal precipitation. **These wet and dry cycles are not unusual.** They appear in all rainfall records. Many people have tried to predict future cycles but such forecasts of wet and dry years have not worked out so far."

Finally we quote a statement by F. W. Reichelderfer, Chief of the U. S. Weather Bureau:

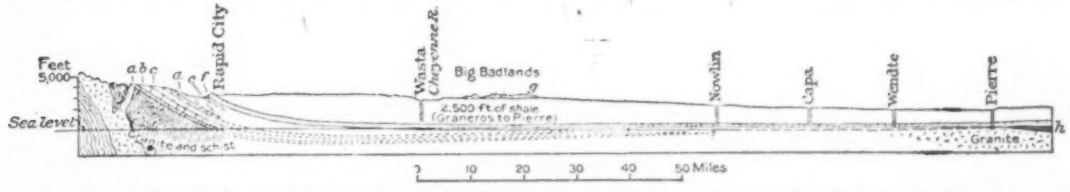
William Sunday drills wells in the area of Mt. Morris, Michigan. Here he is shown drilling a well in shale for a suburban home near Flushing, Michigan.

"We have reviewed the figures on Wisconsin rainfall prepared by our Official in Charge at Madison, and have found them correctly derived from the recorded data. The average rainfall for the period 1886-1911 is 30.62 inches, while that for the period 1913-1938 is 30.42 inches. Our official at Madison represents the difference between these two amounts as a decline of 0.20 inch. However, since random fluctuations of this magnitude are very probable, we would rather represent this 0.20 simply as a chance difference.

"Like Mr. Joos, we have attempted to give some logical interpretation to the allegation that Wisconsin's rainfall has declined 3.84 inches (O'Neill) or 3.48 inches (Chapman) but without success. To say in any meaningful terms that Wisconsin's rainfall has decreased by either of these amounts is hardly justified. We must conclude, therefore, that either the figures are in arithmetical error or have been given some obscure interpretation not consistent with ordinary meaning.

"The series of Wisconsin annual average precipitation is shown on the attached chart for the period 1886-1949. It shows clearly that Wisconsin's annual rainfall has fluctuated quite normally above and below the 1886-1949 mean (30.53 inches), but that these fluctuations have not been regular or given to trends. Statistical tests performed on this series verify this conclusion. The doubt as to the 3.48-inch decline is shown by comparing fluctuations with the two dash lines which are spaced 3.48 inches above and below the mean. If Wisconsin's rainfall had declined as alleged, then the annual rainfall should fluctuate about the lower line for a considerable part of the record to have lowered

(Continued on Page 12)



Section across South Dakota from the Black Hills to the Missouri River. (a) Deadwood formation, (b) Englewood and Pahasapa limestone, (c) Minnelusa sandstone, (d) red beds, (e) Sundance formation, (f) Lakota Minnewasta, Fuson and Dakota formations, (g) White River group in Bad Lands, (h) pre-Cambrian quartzite. (W.S.P. 489).

JOHNSON NATIONAL DRILLERS JOURNAL

A National Journal Published in the Interest of the Well Drilling and Water Supply Industry.

Copyrighted 1950 by
EDWARD E. JOHNSON, INC.
Publishers
ST. PAUL, MINN.

W. M. Bollenbach—
Business Manager
E. W. Bennison ..... Editor

Advisory Staff

K. M. Brown, Past President of A. A. W. W. D.

Jack J. Hinman, Jr., Col.—Corps of Engineers, U.S.A., (Rtd.)

Address All Communications to EDWARD E. JOHNSON, INC., 2304 Long Ave., St. Paul, Minn.

The contents of this journal are copyrighted and must not be reprinted or published without giving proper credit to the authors and this journal. Permission to use articles and to make any minor changes which may be indicated as desirable, together with illustrations, will gladly be given to any responsible parties upon request.

Colorado
Lloyd Oliver, President ..... Greeley
W. E. Code, Secretary ..... Fort Collins

Empire State
Fred H. Merrill, Jr., President ..... Liverpool
Robert Klindt, Secy.-Treas. ..... Morris

Florida
J. P. Carroll, President ..... West Palm Beach
H. M. Vickers, Secretary ..... Miami

Idaho
Allan Hosack, President ..... Nampa
W. B. Bowler, Sec'y-Treas. ..... Boise

Illinois
J. T. Anderson, President ..... Morris
Richard Fisher, Executive Sec'y ..... Urbana

Indiana
Herbert Lamb, President ..... Carmel
H. K. Carr, Secretary ..... Greentown

Iowa
Sylvan Ames, President ..... Lincoln
Travis C. Parker, Sec'y-Treas. ..... West Branch

Kansas
L. L. Martin, President ..... Larned
Hazen Sears, Secretary-Treasurer ..... Paola
A. R. Leonard, Service Secretary ..... Lawrence

Louisiana
A. S. Holliday, President ..... Jonesboro
L. O. Houston, Sec'y-Treas. ..... Shreveport

Maine
Ralph E. Tracy, President ..... Brewer
R. B. Chandler, Treasurer ..... Winter Port

Michigan
Leo Riegler, President ..... Muskegon
Harold Armstrong, Sec'y-Treas. ..... Battle Creek

Minnesota
John Hoge, President ..... St. Paul
Al. A. Zuercher, Sec'y-Treas. ..... St. Paul
Norm Ovram, Service Sec'y ..... St. Paul

Mississippi
J. Leon Pringle, President ..... Hattiesburg
Fred Sutter, Secretary-Treasurer ..... Pass Christian

Missouri
W. F. Steffins, President ..... Alma
Dale L. Fuller, Service Secretary ..... Rolla

Montana
R. I. McCutcheon, President ..... Havre
L. E. Anderson, Secretary ..... Billings

Nebraska
H. O. Parkert, President ..... Hooper
Vincent H. Dreeszen, Secretary U. of N., Lincoln

Nevada
S. R. McKinney, President ..... Las Vegas
William Wright, Vice-President ..... Dyer

New Jersey
Fred Bock, President ..... Rochelle Park
Chas. Greenhalgh, Secretary ..... Lakewood

North Carolina
W. A. Kirkley, President ..... Charlotte
R. O. Heater, Sec'y-Treas. ..... Raleigh

North Dakota
Alfred Jaeger, President ..... Mooreton
Fred V. Sletvold, Sec'y-Treas. ..... Oakes

Northwest
M. West, President ..... Salem, Oregon
Frank Gaut, Secretary ..... Beaverton, Oregon

Ohio
L. E. Bushong, President ..... West Mansfield
E. D. Allen, Sec'y-Treas. ..... Steubenville

Oklahoma
Al Braithwaite, President ..... Enid
L. J. Clarke ..... Oklahoma City

Oregon
T. J. Burkhart, President ..... Portland
Ken Brook, Secretary-Treasurer ..... Scappoose

Pennsylvania
EASTERN DIVISION
Norman A. Cook, President ..... Langhorne
Thomas Magee, Secretary ..... Philadelphia 25
WESTERN DIVISION
R. H. Reinhold, Exec. Chairman ..... Pittsburgh
Mrs. Merle Butcher, Secretary ..... Washington

Rhode Island
D. O. Hamilton, President ..... Portsmouth
D. E. Whelan, Secretary ..... Providence

San Joaquin Valley (California)
Jack De LaGrange, President ..... Madera
Glen V. Slater, Secretary-Treasurer ..... Fresno

Texas
O. F. Jensen, President ..... Houston
Geo. Ringstaff, Secy.-Treas. ..... Houston

Virginia
B. A. Chappel, President ..... Roanoke
Jack Sundquist, Secretary ..... Norfolk

Washington State
Oliver F. Zinkgraf, President ..... Spokane
O. E. Erdman, Sec'y-Treas. ..... Elma

Wisconsin
George Galloway, President ..... Milwaukee
Ralph H. Nienow, Executive Secretary ..... Merrill

TOM'S COLUMN

Dear Fellows:

Well sir, it's hotter than a pistol today so I don't guess this here letter will be much alive with energy. The farmer says we gotta have the heat if we're gonna have the corn even if it always turns out that there's so much corn nobody, includin' the gover'-ment, knows what to do with it. Ma aint in very good humor today so I moved my lazy carcass out here in the tool shed and fixed up a rickety old fan, a coupla bottles of iced beer, and out of that combination maybe I can whip up a piece of literature. Ever since them Russians pushed them north Koreans into a brawl with their own people to the south things have been touchy around the house. Both of the boys are more'n likely to be called fer service if this war thing gets serious. The older boy is in the reserves an' the youngster is now headin' into the draft age. Their ma is pretty upset because it seems like yesterday that the lad came home from the other fracas out of the mud an' muck of god fersaken places in other parts of the world. I reckon nobody knows what old Joe Stalin has got up his sleeve, and right now he's makin' the decisions. I been goin' to prize fights fer a good many years, and I always noticed that the plug ugly who could make the other scrapper fight his way was the hardest guy to beat. These here unorthodox fighters, specially the kind that pay no attention to the rules, might never be a champion but even the best fighters say they are the toughest to try to lick. When you try to figger it all out you're liable to go nuts—so I guess it just happens to be the kind of an age that we're livin' in and we gotta see it through. Its tough on the kids who are just gettin themselves started and it sure is a ordeal fer the fathers and mothers who have to see 'em go. The wars of today can't be separated from the people who have to stay at home—it fouls up the whole economy with shortages, price controls, rationin' and a million other aggravations. About the most I can do about it is to try an' tell ma everything is gonna come out all right—an' reach fer another scoop of cold beer. I was tryin' to cheer her up this mornin' by tellin' her what I thought was a funny story that went like this; I was talkin to a fellow over at one of the jobs lately and he says gawd I wish I had my wife back, and I says where is she? and he says I sold her fer a bottle of bourbon, well I says now you find out you really love her an' he says Hell no, I'm thirsty again. It didn't set so well and that's why I'm out here in the shed.

Me and the boy have been pretty busy lately and lucky enough to get by without too much unexpected trouble. Down in the district we was workin' in there was a Creamery havin' a well put in and the driller doin' the job got to talkin' with the boy about it. He said the company that was buyin the well set up a budget fer the job an' told the driller he'd have to finish the whole operation within

(Continued on Page 9)

(Continued from Page 8)

that amount. When the kid met up with the driller he was just telephonin' fer prices on the cheapest screen he could get to do the work. Then they got to talkin' and the driller said he had to put in a cheap screen if he was to get by on the price the customer had set. The boy says why don't you show the customer that his well aint gonna be no better than the screen in it. The driller said he had tried to tell the company the other material would be better but they wouldn't spend no more. The kid says he'd bet the same company wouldn't skimp on other machinery of construction if they knowed it would cost 'em more in the end to use the cheaper material, why wouldn't they figger the same way when buildin' an important part of their equipment like a water supply. The driller says he couldn't do nothing with 'em but he come up with the bright idea that the boy come with him an' he'd introduce him to the manager like he was a consultant or something. So the lad gets all washed up and tried to make himself look important an' he goes with the driller. The manager was a smart enough business man, an' like all of 'em he wanted to be shown. The boy told him there wasn't nothing wrong with the cheaper — fact is there are some places where it would be very satisfactory, but he went on to point out a few things about the water in that area. It is bound to incrust that metal and that would lead to acid treatments that will sure damage your screen. Well, says the Manager, what happens then? You'd have to switch to a new screen the boy told him. How long would this screen last, says he. Oh maybe four or five years if everything goes well. How much would the better screen material run— oh says the boy I aint got exact prices here but maybe a hundred dollars more. How much would it cost to switch a screen? I'd say anywheres from $400 to $500. You want to remember, the boy told him, you're makin' an investment in your plant here that runs into some thousands—any chemist can tell you what your problems will be with the water you're pumpin' —so why wouldn't you want to use

A. O. Kittelson is one of the better known drillers in North Dakota and Montana. In the picture he is testing a well with a Johnson Screen on the farm of Bert Anderson near New Rockford, North Dakota.

screen material that wont be affected by acids when its necessary to use 'em to clean your screen. And do you know what the manager did—well sir he just rocked back an' forth in his chair fer a while, jumped up and said—and these are the words the kid repeated to me — "Brother you got something there, usin' cheap material fer doin' the most important job would be risking that whole investment." Sounds like a mouth full, but that's what he said.

The driller thanked the kid fer the help, but he said I told him that in the first place but he wouldn't budge. Well, the boy said, maybe you didn't make it clear enough. You see these guys don't usually know anything about wells or screens or water—they kinda rely on what the driller knows if he knows how to tell 'em what he knows. As this Manager said when he gave the new order to the driller — you get me the screen I need to give me the kind of well I should have.

When the boy was tellin' me about this thing he said, "You know, Dad, I've been tellin' you lots of times that we've slipped up in too many cases in not 'selling' the customer on gettin' what he should have. Aside from the fact that he gets a better job, the thing I been harpin' on to you is that you're passin' up some nice profits on those sales. Here this driller just made himself a nice day's wages which he would have passed up if I hadn't helped him. That happens right along and I think we're just foolish if we don't watch these corners and get the extra profit that goes with using better merchandise." Maybe the kid has somethin' there. I'm sure going to watch that closer in the future.

Well, the heat aint lettin' up any so I'll be puttin' a little more action in the fan. Durin' this war scare better watch fer changes and price fluctuations, and maybe material shortages. Hope everything is well with all of you.

Yours truly,

TOM.

WATER AND HEALTH

(Continued from Page 5)

The minerals found in water are therefore of great importance. Hardness which determines the amount of calcium and magnesium in water is probably the most common and best known standard by means of which the ordinary person judges a water. We have heard of all sorts of ailments and complaints being charged to "hardness." There is no scientific evidence to support such claims. As a matter of fact there is much evidence to show that people using hard water are healthier and stronger than those that do not. This is proven by the records of the death rate in soft water states, such as Oregon and Virginia, and in hard water states such as Kansas and Nebraska. The American Medical Association in answer to a question whether hard water was responsible for urinary and kidney infections replied that there was no evidence for such a belief.

Another popular idea about water is that it induces goiter trouble and affects the enamel of teeth. While these troubles are not general, it is true that in certain areas the prevalence of these ailments can be traced to water. Goiter troubles are due to a lack of iodine in water and when this element is supplied either by treatment of the supply or by individual use, goiter

(Continued on Page 15)

SURFACE and GROUND WATER CONDITIONS

The Water Resources Review of the U. S. Geological Survey for May reported new record-breaking floods following close after those in April which occurred in the north-central states and Manitoba. The crest of the flood in Red River of the North reached Winnipeg May 19, with disastrous results. The Mississippi River in Minnesota reached new highs at the same time. In the northwestern states and the Western provinces of Canada spring runoff was late. On account of warm days and cool nights during May, there was some snow melt without large floods, but the amount of snow remaining and the lateness of the season made large damaging floods a possibility. The New York City situation was improved somewhat with reservoir storage reported at 93% of capacity.

In Wisconsin floods were reported throughout the northern part of the state and in the St. Croix and Menominee Rivers they exceeded previous highs.

In northwestern South Dakota, central and western North Dakota and along the Missouri River in eastern Montana there was greater than normal recharge to ground water reservoirs. Water levels were at or near to record highs in the Grand River area in South Dakota and in the Knife River, Heart River, Jamestown and New Rockford areas in North Dakota. In the Oakes area the levels were approximately the same as in the spring of 1949. In the Crosby-Mohall area of northern North Dakota and in the Missouri River basin of eastern Montana, water level changes were less uniform. It is probable that, because of the late spring, many of these wells have not yet received their normal amount of recharge.

In Nebraska ground water storage in the lower Platte River Valley is estimated to be about 50,000 acre feet more than in March, while in the Republican River Valley it is somewhat less than a year ago. In Kansas ground water rises that had been expected did not occur.

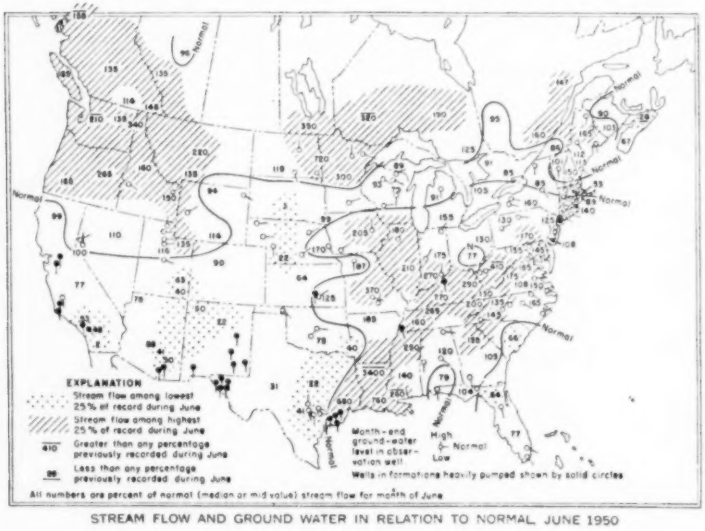
In the West the runoff in the Colorado Basin was deficient, due to delayed snow melt rather than drought conditions in the lower basin.

In the May report the Winnipeg River was reported as reaching a record high stage with continued high runoff in the Minnesota region. Local floods occurred in small drainage basins from Pennsylvania to Nebraska, with drought conditions continuing in the South West.

Ground water levels declined seasonally where there was heavy pumping for air conditioning. In the Townsend and Helene Valleys in west-central Montana ground water levels were lower than a year ago on account of pumping in these valleys.

In California drought conditions continued in the southern portion of the state. Water imported from the Colorado River basin is being used for irrigation and replenishment of ground water in the Santa Ana River basin. In San Diego and Los Angeles counties ground water levels were declining in observation wells.

Ground water levels in downtown Pittsburgh declined to new record lows in several observation wells. In this area where large withdrawals for air conditioning are made, the drop since April has been as much as ten feet in places. In wells throughout Pennsylvania most wells were higher than a year ago. In Michigan the mid-June measurements of 44 shallow wells in the north-central part of the southern peninsula showed a pronounced fall from the mid-May levels. It was predicted that the decline in levels would continue until September, at least. In Indiana the change from April to May weather was more pronounced than usual. More than normal rain fell during April while in May it was below normal for the state in general. Water levels in observation wells in the south and southwestern third of the state generally, and in the South Bend area, showed a rise during May. The wells in the remainder of the state indicated a lower water level, which is the usual seasonal trend.


EXPLANATION
Stream flow among lowest 25% of record during June
Stream flow among highest 25% of record during June
410 Greater than any percentage previously recorded during June
86 Less than any percentage previously recorded during June
All numbers are percent of normal (median or mid-value) stream flow for month of June
Month-end ground-water level in observation well
High
Low
Normal
Wells in formations heavily pumped shown by solid circles

STREAM FLOW AND GROUND WATER IN RELATION TO NORMAL, JUNE 1950

—o—

"You say this woman shot her husband with this pistol, and at close range?" asked the coroner of the eye witness to a colored tragedy.

"Yassuh," replied the witness.

"Are these powder marks on his body?"

"Yassuh, das why she shot him."

—o—

The nurse entered the room of the absent-minded professor and said softly, "It's a boy, Sir."

Looking up from his desk, the professor replied, "Well, what does he want?"

PROTECTION OF GROUND WATER SUPPLIES

EDITOR'S NOTE:

For a number of years we have been watching a development in the field of ground water that we feel should be of vital concern and interest to well drillers, engineers, and others engaged in the development, use and conservation of ground water.

We refer to a general awakening of the part of well users and public officials as to the importance and necessity of dependable sanitary ground water supplies. This has led to a number of regulatory and supervisory laws being passed having to do with licensing of well drillers, the adoption of well drilling codes, the construction of sanitary wells and the conservation of ground water.

In order that our readers may keep abreast of these developments, we intend to publish a number of these measures, some of which are now on the statutes and others that have been proposed. We feel that drillers should know about these things and be prepared to present their side of the case whenever such measures are up for consideration in their respective states.

All articles pertaining to these subjects will appear under the heading used for this article, so as to be sure our readers know what is going on.

WE WISH IT DEFINITELY UNDERSTOOD THAT IN REPORTING THE FACTS WE ARE NOT PASSING JUDGMENT ON THE MERITS OR NECESSITY OF ANY LEGISLATION NOW IN EFFECT OR THAT MAY BE PROPOSED LATER.

GROUND WATER IN NEBRASKA

Nebraska is one of the most favorably located states in the Union as far as ground water is concerned as it has an unlimited supply within easy pumping distance under practically all parts of the state. Dr. George E. Condra, Director of the Conservation and Survey Division, of the University of Nebraska, has estimated the amount of ground water in comparatively shallow formations as 950,000,000 acre feet or more. This does not include deep water in the basal rock formations.

Even this vast amount of ground water has not prevented the State of Nebraska, through its official agencies, from co-operating with the U. S. Geological Survey for over thirty years in finding out more about this great natural resource. Most of the work has been done under the direction of Dr. Condra with the result that Nebraska now has more information concerning its ground water resources than any other state in the Union.

Being an agricultural state, the greatest use now being made of ground water is pump irrigation. The use of ground water for public water supplies comes first, of course, but there is still vast quantities of water available for pump irrigation. The increase in use of ground water from the time co-operative state and federal surveys were started has been from 300 irrigation wells in the beginning to more than 6,000 irrigation wells in 1947. Approximately 500,000 acres are under pump irrigation in Nebraska. At present there is no law in Nebraska regulating or allocating the use of ground water, but the people of the state as well as the state officials are keenly aware of the necessity for protection and conservation of their water supplies.

Cia. de Perfuracoes Comerciais, S.A. of Rio de Janeiro is a water well drilling company organized by the Commercial Drilling Company of Cleveland. It is prepared to do all kinds of well drilling, test drilling and diamond core drilling. The picture shows one of their rigs starting on a 400-mile trip through rugged country to drill a well at Vitoria da Conquista. All well logs are drawn up and certified to the Department of Geology and Mineral Study by a qualified engineer.

The State Board of Health in Nebraska is charged with the duty of approving of all wells constructed for municipal supplies. Most of the well drillers and contractors co-operate gladly with this department in their effort to provide the people with safe potable water supplies, though occasionally a well is put down without this approval.

While the need for licensing of well drillers and legislation to control the use of ground water is not seriously considered at this time, there is a good deal of thought being given to conservation. Artesian wells are being capped and not allowed to run to waste. The University of Nebraska and the Nebraska Irrigation Association in co-operation with the Nebraska Well Drillers Association are constantly studying the use of ground water and the construction of better designed wells.

That this sort of interest in and study of ground water resources pays dividends cannot be denied, as the farmers, well drillers, and city officials in Nebraska now have all of the information they need to locate new wells or supplemental wells as they are required. There is no longer any mystery about ground water in Nebraska. Every one interested in its development, uses and conservation can find out all they need to know by consulting the Conservation and Survey Division of the University of Nebraska at Lincoln. Here they will find the records of wells in all parts of the state for over thirty years, they can see actual drilling samples of all the various water-bearing formations in the state. Maps showing the surface and underground conditions in any part of the state are drawn up in wall size. Accumulated records of the water table movements taken from 700 observation wells are plotted so that anyone can see the "ups and downs" of the water level in wells, in both wet and dry years. Maps showing the depths and thickness of water-bearing formations anywhere in the state are open to the public. Just what this has meant to the people of Nebraska economically is hard to say. Undoubtedly it has saved many dollars that might have been spent for testing and prospecting. The greatest benefit, though, has been in the lo-

(Continued on Page 15)

RAINFALL IN WISCONSIN

(Continued from Page 7)

the average to 3.48 inches below normal. In fact, it should now be fluctuating about the lower line. This is plainly not the case, as can be seen on the chart. As a matter of fact, the annual rainfall has fluctuated erratically above and below the dashed lines exceeding the average rainfall by more than 3.48 inches 11 times, and being below it more than 3.48 inches also 11 times. We hope that this makes it clear that Wisconsin rainfall is a reasonably reliable weather factor, and that farmers need not be concerned about a change in Wisconsin's climate, at least not a premanent change in the foreseeable future."

It is difficult to explain why O'Neill, a man with little or no technical training but with high standing as a science editor, should make such a blunder. It is even more difficult to understand why the ghost writer for Chapman should serve such misinformation to the public. You well drillers know the facts and can assure your public that there is **no decline in the average annual rainfall of Wisconsin shown by records going back to 1837.**

It is likely that the writers were attempting to explain the serious shortages in various parts of the country. Had these writers consulted Dr. Sayre of the U. S. G. S. he could have reassured them as follows:

"Throughout the period of record the available water resources, except for local and temporary variations due to draughts, have remained essentially constant. I know of no evidence in either precipitation, stream-flow, or groundwater data that controverts this statement. During the past 40 to 65 years, stream runoff in many places, as shown by carefully selected records of the U. S. Geological Survey, showed a downward trend which reached its lowest point in the decade from 1930 to 1940, but most records show an upward trend since 1940. The Geological Survey notes that precipitation data of the U. S. Weather Bureau show no definite trend toward long-term declines. Records of water levels in nearly 15,000 observation wells maintained by the Geological Survey and its cooperating agencies show no overall trend toward decline. There are many areas where water levels have declined because of pumping or other activities of man and, of course, water levels have temporarily declined as a result of severe droughts. Even the great drought of the thirties was subsequently offset by above-average precipitation which fully restored stream flow and ground-water levels to predrought stages."

In Wisconsin we know that there has been a tremendous increase in the use of water. Modern plumbing, fire protection, air conditioning, industrial uses, and irrigation have been responsible for much of the increase. This trend toward increased use will continue. A few problem areas have been developed by the increased consumption of ground water. In Milwaukee County, the static level of the artesian well water has dropped a maxium of 370 feet since 1877. The average drop from 1946 through 1949 was 24 feet. In Waukesha, the drop in the same period was 15 feet. In Green Bay, the drop averaged 7 feet per year during 1948 and 1949. There is no evidence as yet that the condition in any area is critical because in each problem area an adequate supply can be secured at increased cost.

The Public Service Commission in co-operation with the U. S. G. S. have 101 gaging stations in operation, 50 of which have 30 to 35 years of record. The University in co-operation with the U. S. G. S. have conducted a modest program of ground water investigation since 1946. The very nature of groundwater research requires the accumulation of information over a considerable period of time. The volume of water removed by pumping, the levels of water in the wells as influenced by pumping, records of water levels in all parts of the state are some of the basic data required. The longer and more complete the record, the more accurate are the conclusions which may be drawn.

ASSOCIATION NEWS

This section is devoted to the exclusive use of water well drillers' associations, both state and local. Notices, announcements, changes of officers and other items should be sent to The Editor, Johnson National Drillers' Journal, 2304 Long Ave., St. Paul, Minnesota.

PENNSYLVANIA MEETING

The Eastern Division of the Pennsylvania Water Well Contractors Association was held Saturday, June 24, in the Walnut Room of the Berkeshire Hotel in Reading.

The meeting was presided over by N. A. Cook, the President, assisted by others. Mr. John H. Rulon, Vice-President, discussed Safety in Well Drilling and Mr. Trueller reported on a survey he had made of well drilling throughout the middle and far West. Mr. Andrew J. Nicholas reported on the recent meeting of the Michigan Well Drillers Association which he had attended.

Mr. Nicholas and Mr. Trester were elected as co-Chairmen of the Publicity Committee to succeed Mr. Houston. Mr. Paul Myers was elected Second Vice-President and Mr. Frank Parrenti, Third Vice-President.

A steady increase in membership was noted with the charter membership at reduced fee in demand. The next meeting of the Eastern Division will be held July 22 at noon daylight-saving time at the Hotel Edison, Sunbury, Pennsylvania. A business meeting and a program will be held after luncheon is served.

The Western Division of the Association held a meeting May 13 at DuBois, Pennsylvania, at which time a Board of Directors was elected. The Temporary Chairman was Mr. R. H. Reinhold of Pittsburgh and the Secretary Mrs. Merle Butcher of Washington. The Board of Directors decided to meet in Rymersburg June 17, and arrange for another division meeting in July.

EMPIRE STATE MEETING

This association held its second exposition at the Syracuse Hotel in Syracuse, New York, July 13, 14 and 15. According to Ray S. Knapp, Vice-President, arrangements were made to have several drilling rigs and other well equipment on display at the Genessee Street Armory. Smaller exhibits were placed inside the Armory. Robert E. Klindt, Morris, is Secretary-Treasurer of the association.

OHIO MEETING

The Ohio Association held a regular meeting Saturday, June 17, in the State Office Building at Columbus. Mr. E. D. Allen, Steubenville, is Secretary and Treasurer.

MICHIGAN MEETING

The 22nd annual meeting of the Michigan Association was held at Lansing, June 20 and 21, with the largest attendance in the history of this association. With no formal program the time was devoted to registration, viewing exhibits, business meetings, and getting acquainted.

The annual banquet was held the evening of the 21st at the Masonic Temple. Leo Riegler of Muskegon was re-elected President. This association has eight local chapters which meet regularly throughout the year in various parts of the state.

INDIANA MEETING

The 19th annual meeting of this association was held in Fort Wayne, May 25, 26 and 27, as scheduled. The following officers were elected during the business session: Herb Lamb, President, Carmel; Walter Gordon, Treasurer, Churubusco; H. K. Carr, Secretary, Greentown.

During the session Paul E. Fitzgerald of Dowell, Inc., spoke on "Chemical Treatment of Water Wells." Subjects of interest were discussed by the drillers present.

The meeting ended with a business session on the 27th. The anunal banquet and entertainment were held at the Van Orman Hotel the evening of the 26th.

SAN JOAQUIN VALLEY MEETING (California)

At a recent meeting of this association, Jack De LaGrange of Madera, California, was elected President and Glen V. Slater of Fresno, Secretary and Treasurer.

NEVADA MEETING

At a recent meeting of Nevada drillers held in Tanopah, Mr. S. R. McKinney of Las Vegas was elected President with William Wright of Dyer as Vice-President. Mr. Hugh A. Shamberger, Assistant State Engineer, assisted in the organization of the association.

NORTH DAKOTA MEETING

The North Dakota Association held its annual convention in the War Memorial at Bismarck, July 24, 25 and 26. Space was available for both inside and outside exhibits and the committee prepared a program of interest to the drillers attending. Mr. Fred V. Sletvold of Oakes, Secretary-Treasurer, was in charge of arrangements.

The Patterson Drilling Company went all out at the recent "Centennial Days" exposition held in Olympia at the State Armory. Notice the pumping model well on the left and the small model drilling rig on the right. The booth was shared by the Universal Pump Sales Company. The characters in Centennial costume are standing left to right: William Stevenson of Universal, Gerald M. Patterson, Jr., helper, Gerald M. Patterson, Sr., co-partner and driller of the Patterson Drilling Company. Kneeling are R. S. Rickard, driller and Merle B. Patterson, co-partner. This company operates four rigs in the Olympia area principally farm, municipal, and industrial wells.

IDAHO MEETING

Mr. W. B. Bowler, Secretary of the Idaho Association, announced the plans for the annual meeting of the Idaho Association, which was held July 17 and 18 at Hotel Boise in Boise. The program included discussions of matters of current interest to drillers, also the election of officers and directors for the coming year.

MISSISSIPPI MEETING

Mr. Fred Sutter, of the new Mississippi Water Well Contractors Association advises of the formation of this organization at Jackson on Saturday, June 3. Mr. J. Leon Pringle of Hattiesburg was elected President, Mr. W. K. Journey of Greenwood, Vice-President, and Mr. Sutter of Pass Christian, Secretary and Treasurer.

The state was divided into four sections with two directors being elected from each section. The meeting decided that their first job was to get new members after which they would take up the question of conserving water supplies and other questions of benefit to the industry. A meeting will be held in the fall with the date to be announced later.

VIRGINIA MEETING

The Virginia Well Drillers Association will hold its annual meeting at the Hotel Patrick Henry, Roanoke, Virginia, on September 29 and 30.

A program of interest is being prepared for those attending. Space will be available for the display of small equipment in the hotel and a lot adjacent to the hotel for larger equipment.

Mr. D. A. Chappel, President, R.F.D. 4, Box 71, Roanoke, is in charge of arrangements for space and rates.

Farmer—"This is a tobacco plant."

City Miss—"And how long will it be before the cigarettes are ripe?"

—Public Service News.

ADVERTISEMENTS

We will insert advertisements for drilling equipment wanted or for sale, help or work wanted, etc., for our readers, free of charge. Advertisements must be brief, and we cannot assume responsibility for them, but will be glad to put parties in touch with each other by this means and suggest that they investigate any offers or inquiries carefully for themselves.

FOR SALE OR TRADE—One Armstrong Drilling Machine with steel derrick mounted on 4-wheel rubber tire trailer; also pump tools and business and one '41 Ford pickup and a '41 Chevrolet truck. Write: Hans Madsen, 423 10th Street South, St. Cloud, Minnesota.

FOR SALE: 21W purchased new in 1949 mounted on a 1941 Chevrolet 1½-ton truck; 500 feet of ⅝-inch drill line, 500 feet ⅜-inch sand line, blower, tool guide (Keystone), complete string of tools for 5⅝-inch hole and an acetylene welded; price complete $3,250.00. Write: Max Linn, Black Rock, Arkansas.

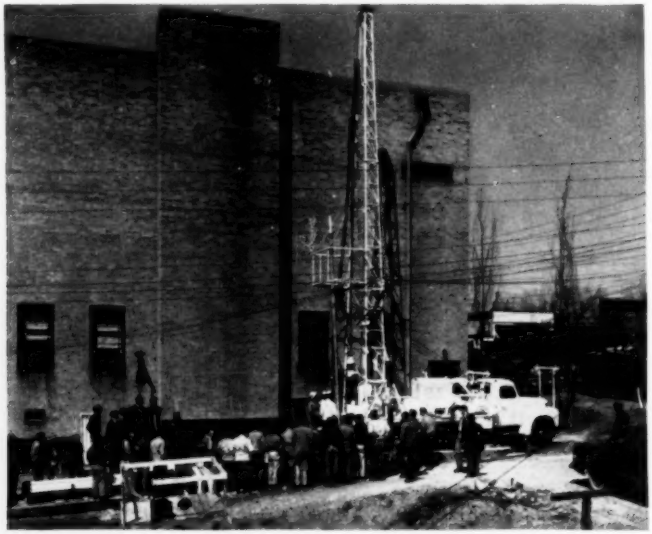
FOR SALE: Austin drilling rig, mounted on '35 Chevrolet truck, both in very good condition; 34-foot derrick powered by Model A motor and transmission. This machine is operating every day. Write or phone Walter Ervin, Kerkhoven, Minnesota, phone 1F26.

FOR SALE: Drilling equipment, one 55 Star on Diamond T-35 truck with cable and tools, practically new; also one 71 Star on Studebaker '48 truck with cable and tools, one month old. Will sell with or without tools. Write or phone: Harold Flolo, Ortonville, Minnesota.

FOR SALE: One all-steel well drilling machine mounted on International Tractor; drills from 4-inch to 14-inch wells, about 300 feet cable. Write: Mrs. Joseph Eggum, Box 342, Elbow Lake, Minn.

FOR SALE: Slim hole rotary drill rig, mounted on heavy White truck, a frame derrick and hoist, Wheatley, Mission, fitted pump 75 engine, double drum American Hoist with 50 H. P. engine, table, hose, etc., complete with drill collars, 450 drill stem and Hughes rock bits mud mixer, tongs, slips heavy army trailer for hauling stem, Kelley, etc., rig complete ready to go; photographs on request. This outfit cost $20,000.00 to assemble, best offer takes cash, f. o. b. Delafield, Wisconsin; also for sale, No. 1½ Steel Keystone drill, a frame steel derrick with hoist, Bucyrus rubber top Waukesha 4 cylinder engine, V-belt drive with Cotta, transmission mounted on dual Titian truck with platforms for hauling rig and truck as is, no tools nor lines. Price cash $1,500.00; 6-inch tools and lines as is on machine, add $500.00 f. o. b. Delafield, Wisconsin. Write: Gray Well Drilling Company, Inc., P. O. Box 181, Delafield, Wisconsin.

FOR SALE: One No. 16 Ideco Spudder mounted on 2-ton 1940 International truck, rig is 3 years old; tools from 4 to 12 inches; reason for selling, health bad; also have Hobart Welder 250 amp. like new, cost $850.00, will sell for $600.00. For price on rig and tools, write: Ralph Stone, Route 1, Shady Lawn Farm, Langsville, Ohio.



At the recent meeting of the Missouri Well Drillers Association at Rolla this Failing 1500 Holemaster rig was set up in the rear of the Missouri Geological Survey Building. A well was completed in the Roubidoux sandstone at 290 foot depth.

FOR SALE: One No. 42 Cyclone Spudder with 6 cylinder Continental Industrial Motor mounted on 1937 two-ton International truck; spudder and motor in A-1 condition; also one 1½-ton Ford truck and large assortment of tools; complete outfits and equipment priced for quick sale. Write: P&H, c-o Edward E. Johnson, Inc., 2304 Long Avenue, St. Paul, Minnesota.

FOR SALE: One 22-W Bucyrus-Erie drilling machine mounted on a 1936 1½ ton Diamond T truck; machine and motor are in excellent condition; price for complete outfit $3,200.00. Write: Hoeg & Ames, Lincoln, Iowa.

FOR SALE: No. 25 Armstrong trailer mounted on hard rubber, with Bucyrus rubber shock absorber in derrick; roller bearing jack shaft, for V-belt drive; no motor nor tools. Good machine for deep clean-out or 1200 ft. drilling. Cash $1000.00, f.o.b. Delafield, Wisconsin. Write Gray Well Drilling Company, P. O. Box 181, Delafield, Wisconsin.

BUSINESS OPPORTUNITY: Partnership or will sell outright, Bucyrus-Erie 21 W mounted on G.M.C. army truck; all tools for drilling 2" to 6" wells; shop equipment including oil furnace, blacksmith forge, actylene and portable Lincoln electric welder, pipe, pumps, and supplies, shop 20' x 40', two homes. If interested, write: Thomas Beadle, R. R. 2, Cheboygan, Michigan.

FOR SALE: One Sparta band wheel type with band wheel clutch 36-foot telescope mast; calf reel with ½" cable; 500 feet ⅝" cable; 300 feet ⅜" cable; mounted on '36 Federal 2-speed axle 5-speed transmission truck; can be had with semi-equipment; with or without tools. Write: Martin Mastrian, 502 - 4th Ave. East, Superior, Wisconsin.

FOR SALE: Well drilling machine for sale; cathead; two 4" pumps driven by Chevrolet power, mounted on 1936 L. W. B. Dodge truck, in good shape, tools, large tool chest and some supplies; selling on account of health and age. Write: Louis H. Schlacht, Box 367, Monticello, Minnesota.

FOR SALE: Ideco No. 10 complete with 500 ft. cable and sand line; a complete set of tools for 4" well, mounted on a Ford V-8 1941 truck; machine has been out one year. Priced to sell. Also have for one No. 3A Engineering Laboratory core drill with 200 ft. of 1¼" drill stem and tricone bits for 4" hole. This outfit is easily attached to any cable tool outfit; this has a 5½ H.P. B. & S. Engine to turn rotary table; this outfit can be installed or taken off of cable tool outfit in 10 minutes time. Selling on account of ill health. Write: C. E. Stevens, Findlay, Ill.

WANTED: Number 55 Speed Star, used but in good condition and reasonably priced. Write: Jacob Kons, Route 4, Appleton, Wisconsin.

WANTED TO BUY: A good used 22-W Bucyrus Erie drilling rig, without tools and truck. Write: Ed Kriegel, Antigo, Wisconsin.

(Continued on Page 15)

(Continued from Page 14)

JOB WANTED: Experienced driller of ten years: 32 years old; have had own business 5 years; am now in territory with much competition; would like work in new territory; will go anywhere; am also interested in foreign drilling. Write: Lyle Mix, Potterville, Michigan.

WANTED: Used drilling machine; would prefer a 55 Star, a late model 240 Star or other equivalent make; with or without tools; also interested in used cable tools for holes ranging from 10-20 inch. State price and condition. Write: J. Kriska, Seffner, Florida.

FOR SALE: Three rotary drilling rigs with 45-foot derricks; one mounted on Diamond T-truck; another on K-7 International truck; and one is a skid rig; all three of these rigs will be sold singly or as a group at bargain prices. Write: American Water Company, P. O. Box 626, Bay City, Texas.

FOR SALE: All tools and equipment necessary for a rig to drill 10, 8, 6, and 5-inch holes; including light plant, water tank; 575 ft. 6⅝" I.D. 17 lb. casing; 45 feet 8" 28 lb. casing; two good 18 H.P. power units; complete for $2250.00. Write: Paul Pierson, Longton, Kansas, phone 174.

WATER AND HEALTH

(Continued from Page 9)

trouble can be controlled. In the case of mottled teeth, the trouble is due to excessive amounts of fluorine. This is manifestly a problem of removing fluorine or reducing it to amounts that will not be harmful. The one thing interesting about mottled teeth is the length of time required to see the effect on the teeth. This is from seven to ten years and it takes about the same length of time to restore the damaged teeth when changing from a supply with excess fluorine to one without fluorine.

In addition to the problems of water chemistry which affect our health, there are also the problems in biology, which have to do with algae, bacteria, or protozoa in our water supplies. The control and elimination of these dangers to health are more complicated than the chemical problems and new ones are being discovered every day. None of them are so serious they cannot be controlled. However, the whole subject of water and its influence on our personal and public health is more important than the average person thinks. As Dr. W. J. Mayo, of the Mayo Clinic, Rochester, Minnesota, once said, "Sometimes I wonder whether the study of the various elements which compose the body tissues would not have been more informative if we had been more curious about water and learned more about its constitution."

JACUZZI AQUAMAT

Here's a revolutionary new water system so compact you can tuck it under the kitchen sink, so low cost anyone can afford it. It's the Aquamat, brand-new one-unit water system now being marketed by Jacuzzi Bros., Inc. The 10-gallon pressure tank completely encases the close-coupled jet pump and ⅓-horsepower, slow speed horizontal motor concealed beneath the tank. The result—a "modern appliance" water system only 27 inches high and 16 inches in diameter. The young lady in the above photograph holds the motor cover revealing the pump-motor unit. System pumps 250 gallons per hour from depths to 22 feet. Aquamat is currently advertised at $89.50 retail list, a new low for jet pump water systems.

GROUND WATER IN NEBRASKA

(Continued from Page 11)

cation and construction of hundreds of irrigation wells which have contributed millions to the economy of the state to say nothing of the improvement of the land and increased enjoyment of life by the people using Nebraska's ground water.

"Yeah," said the sophomore, "When I first came here I was pretty conceited, but they knocked that out of me and now I'm one of the best fellows in college."

—Banter.

—o—

Professor—"Name a liquid that won't freeze."

Freshman—"Hot water."

—The Covered Wagon.

PICTURES . . .

We need them badly for use in the Journal. Send us your prints or negatives with write-up if you wish to. They will be returned if you want them back after we have finished with them. Don't delay sending whatever you have, as we need these pictures now. Thanks.

EDWARD E. JOHNSON, INC.
2304 Long Ave., St. Paul 4, Minn.

What Does Your Customer REALLY Want?

●

Does he want an efficient and economical source of water? Or does he want a cheap and short-lived installation? Nine times out of ten, your customer is interested in getting a permanent well with low upkeep costs.

If you give your customer a cheap screen, will that help to achieve his objectives, or will it actually cost him more in the long run than a Johnson Welded Well Screen?

The first cost of anything is not the only important cost—it's the upkeep that counts. Therefore, isn't it false economy to pinch pennies on

"The Heart of The Well"—the Johnson Welded Well Screen?

There is no substitute for quality.

\\\

A company's greatest asset is the confidence of its customers.

EDWARD E. JOHNSON, INC.

MANUFACTURERS EXCLUSIVELY

SAINT PAUL 4, MINNESOTA